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Chemical footprint assessment: presentation of method and application to a case study involving different spatial scales

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Diamond, M. L., Bjørn, A., Birkved, M., & Hauschild, M. Z. (2014). *Chemical footprint assessment: presentation of method and application to a case study involving different spatial scales*. Abstract from SETAC Europe 24th Annual Meeting, Basel, Switzerland.

330 Chemical footprint assessment: presentation of method and application to a case study involving different spatial scales M.L. Diamond, University of Toronto / Department of Earth Sciences; A. Bjorn, Technical University of Denmark / Department of Management Engineering; M. Birkved, Technical University of Denmark; M.Z. Hauschild, Technical University of Denmark / Department of Management Engineering. Expressing Life Cycle Impact Assessment (LCIA) results as footprints is gaining increasing attention by scientific and political communities alike. Footprint assessments have the potential to improve our ability to communicate environmental impacts to stakeholders since footprints are expressed in units more intuitive than those of traditional LCIA impact categories. Furthermore some footprint methods, such as the ecological footprint, can be compared with a carrying capacity, which qualifies them as indicators relevant to environmental sustainability assessment. Footprint methods related to land use, water use and carbon emissions are well established, but as of now, no operational chemical footprint (ChF) indicator exists. We present a newly developed ChF method for quantifying the combined ecotoxicological impact in freshwater from emissions within a territory. In this context a ChF is defined as "the occupation of a (theoretical) fresh water volume needed to dilute a chemical emission to the point where it causes no damage to ecosystems in the volume during its presence". $HC5_{NOEC}$, the concentration at which a maximum 5% of modeled ecosystem species are affected, is used as a safe reference concentration. This allows for the conversion of the USEtox output [$PAF.m^3.day$] into a ChF [km^3]. Results can be compared to the availability of surface freshwater at the relevant spatial scale. We tested the feasibility of the method by applying it to an inventory of the chemical emissions within Europe in 2004. We found that the ChF of several large European cities exceeded the carrying capacity of surrounding freshwater bodies by more than 10 times, although the carrying capacity of all European surface freshwaters on average was close to non-exceedance. This observation illustrates the inhomogenous distribution of surface freshwater and chemical emissions within the European continent and the importance of focusing territorial ChF assessments on cities and their surrounding freshwater bodies. This method of calculating ChF for freshwaters has the benefit of being easily communicated to decision makers and furthermore, is relevant for environmental sustainability assessment because it directly relates to the environment's carrying capacity. The weakest link in the assessment is knowledge of emission inventories at the spatial scale of cities to small regions.